

Similar Distributions of Dupuytren's Contracture and Y-Chromosome Haplogroup I Among Modern Europeans Suggest Simultaneous Spreading of These Traits Some 40 to 10 KYA

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ABSTRACT

A proposition is made that when two independent traits show similar regional patterns of incidence among modern European regions, a plausible expectation is that these two, otherwise unrelated traits, have simultaneously been spread by migration of our ancestors. As a potential example for the proposed concept, distribution of patients with Dupuytren's contracture is here compared with the reported European distribution of Y-Chromosome Haplogroup I, a genetic marker linked to the last glaciation period.

Key words: Ice Age, trait spreading, early Europeans, Dupuytren's contracture, Y-chromosome Haplogroup I

Review

A contracture of the hand caused by palmar fibromatosis (Dupuytren's contracture) is more frequent among individuals of Scandinavian or Northern European ancestry^{1–4}, although the contracture is also common in Spain⁵ and Bosnia⁶, but not in other Mediterranean regions. This specific pattern of high incidence European areas has brought us the usage of more vernacular terms "Viking disease" or "Celtic hand". The usual interpretation is that the palmar fascia of these patients becomes thick due to a change of its collagen type from type I to type III. Since these patients also have a high risk of plantar fibromatosis, we can assume that similar mechanisms of changing the collagen type are shared by these two disorders.

Despite many epidemiologic studies, risk factors for developing Dupuytren's contracture are just a few^{1–4}. They include hand trauma, diabetes mellitus and phenytoin therapy, while exposure/occupational factors often remain uncertain. Men are almost ten times more prone to develop palmar contracture than women. The contracture mainly occurs in men older than 40 years, often in individuals with a family predisposition.

Despite a very specific regional incidence pattern within Europe, this common health issue is not usually re-

garded as an evolutionary relict selectively passed from our remote ancestors to modern Europeans. A probable reason for this omission might lie in the fact that palmar fibromatosis is not clearly linked to a certain gene⁷, so, at best we can only discuss the inherited predisposition of acquiring the contracture.

If looked more closely, the regional incidence pattern of Dupuytren's contracture is similar to the reported distribution of Y-Chromosome Haplogroup I (Hg I) used to reveal distinct domains of gene flow in Europe⁸. Hg I is present in more than one-third of paternal lineages in Scandinavian populations and in the northwestern Balkans. Relatively high frequencies are found in Low Normandy and southern France. The authors' interpretation is based on the idea that the Scandinavian Peninsula was completely depopulated during the Last Glacial Maximum (LGM)(26.5 to 19 Kya), thus leaving the Iberian Peninsula/southern France and the Ukraine/Central Russian Plain as possible regions for Scandinavian repopulation. They have concluded that Haplogroup I provides a record of European-specific paternal heritage, including pre-LGM differentiation followed by population contraction, isolation in small refuge areas, and post-LGM recolonization of northwestern Europe from refuge areas in Franco-Cantabria and in the east Adriatic–North Pontic region.

A proposition is made that when two independent traits show similar regional patterns of incidence among modern Europeans, a plausible expectation is that these two otherwise unrelated traits have simultaneously been spread by the migrations of our ancestors. The described similarity of Dupuytren's contracture and Haplogroup I incidence patterns (Scandinavia, Iberia, Balkan) then suggests that both traits have emerged during the Last Glacial Period.

In short, here proposed interpretation is that spreading of genes related to the occurrence of Dupuytren's contracture among early Europeans was also related to migrations before and after the LGM (40 to 10 KYA).

The remaining question is what might have been the decisive survival advantage for male individuals with a predisposition for Dupuytren's contracture. It can be assumed that although some of old male early Europeans were prone to develop Dupuytren's contracture, they might have been better adapted to survival challenges during their young, generative years.

Based on this idea, a simple scenario can be drawn. During the Last Glacial Period, the European climate was cold and arid with abundant dust in the atmosphere. The LGM dust levels from ice cores, were 20 to 25 times greater than the present levels of atmospheric dust^{9–12}. Probable causes for this long lasting dustiness included glacial erosion, scarce vegetation, aridity with little precipitation and strong winds. This increased dust exposure, started more than 40 Kya and ended less than 10 Kya, formed European loess ridges aligned with the prevailing winds^{13, 14}.

Water sources were scarce and the lack of drinkable water might have forced anatomical adaptations in our ancestors that would improve hill climbing toward the bases of glaciers as the most reliable sources of fresh water in this environment. This means that survival challenges favored climbers, individuals with stronger connective tissue in their extremities. When a predisposition for developing D'sC has emerged, these genes were easily spread among remaining early Europeans. Individuals with this predisposition were more physically able, so they survived longer and produced more children. Very few of them would survive long enough to develop palmar contractures that would compromise their climbing skills.

In other words, due to the prevailing younger age of our ancestors in this harsh environment, the predisposition for Dupuytren's contracture was much more an advantage than a health issue. The result is easy spreading of this predisposition among early male Europeans by the same route used by individuals carrying Y chromosome with the Haplogroup I.

The proposed interpretation might be related to the reported high incidences of Dupuytren's contracture among contemporary climbers. It was reported that 19.5% of male climbers had developed Dupuytren's disease and at an earlier age of onset than in the general population, thus suggesting that repetitive trauma to the palmar fascia predisposes to the development of Dupuytren's disease in men¹⁵.

REFERENCES

1. HART MG, HOOPER G, *Postgrad Med J*, 81 (2005) 425. — 2. LARSEN S, KROGSGAARD DG, AAGAARD LARSEN L, IACHINA M, SKYTTE A, FREDRIKSEN H, *J Hand Surg Eur Vol*, 40 (2015) 171. — 3. MURPHEY MD, RUBLE CM, TYSZKO SM, ZBOJNIEWICZ AM, POTTER BK, MIETTINEN M, *Radiographics*, 29 (2009) 2143. — 4. LANTING R, BROEKSTRAD C, WERKER PM, VAN DEN HEUVELER, *Plast Reconstr Surg*, 133 (2014) 593. — 5. QUINTANA GA, *Ann Chir Main*, 1988;7(3):256-62. — 6. ZERAJIC D, FINSEN V, *BMC Musculoskeletal Disord*, 5 (2004) 10. 7. BALAJI KN, KAVERI SV, BAYRY J, *N Engl J Med*, 365 (2011) 1740. — 8. ROOTSIS, MAGRI C, KIVISILD T, BENUZZI G, HELP H, BERMISHEVA M, KUTUEV I, BARAC L, PERICIC M, BALANOVSKY O, PSHENICHNOVA A, DION D, GROBEI M, ZHIVOTOVSKY LA, BATTAGLIA V, ACHILLIA, AL-ZAHERY N, PARIK J, KING R, CINIOGLU C, KHUSNUTDINOVA E, RUDAN P, BALANOVSKA E, SCHEFFRAHN W, SIMONESCU M, BREHM A, GONCALVES R, ROSA A, MOISAN JP, CHAVENTREA, FERA K V, FÜREDIS, OEFNER

- PJ, SHEN P, BECKMAN L, MIKEREZI I, TERZIC R, PRIMORAC D, CAMBON-THOMSEN A, KRUMINA A, TORRONIA, UNDERHILL PA, SANTACHIARA-BENERECETTI AS, VILLEMS R, SEMINO O, *Am J Hum Genet*, 75 (2004) 128. — 9. SPIELHAGEN RF, BAUMANN KH, ERLKENKEUSER H, NOWACZYK NR, NORGAARD-PEDERSEN N, VOGT C, WEIEL D, *Quaternary Sci Rev*, 23 (2004) 1455. — 10. LAMBERT F, BIGLER M, STEFFENSEN JP, HUTTERLI M, FISCHER H, *Clim Past*, 8 (2012) 609. — 11. KOHFELD KE, HARRISON SP, *Earth-Sci Rev*, 54 (2001) 81. — 12. CLAQUIN T, ROELANDT C, KOHFELD K, C S.P. HARRISON SP, TEGEN I, PRENTICE IC, BALKANSKI Y, BERGAMETTI G, HANSSON M, MAHOWALD N, RODHE H, SCHULZ M, *Clim Dynam*, 20(2003) 193. — 13. HAASE D, FINK J, HAASE G, RUSKE R, PECSI M, RICHTER H, ALTERMANN M, JAGER KD, *Quaternary Sci Rev*, 26 (2007) 1301. — 14. FRECHEN M, OCHES EA, KOHFELD KE, *Quaternary Sci Rev*, 22 (2003) 1835. — 15. LOGAN AJ, MASON G, DIAS J, MAKWANA N, *Br J Sports Med*, 39 (2005) 639.

SLIČNA POJAVNOST DUPUYTRENOVE KONTRAKTURE I HAPLOGROUPE I NA Y KROMOZOMU U SUVREMENIH EUROPLJANA SUGERIRA ISTODOBNO ŠIRENJE OVIH ZNAČAJKI PRIJE 40 DO 10 TISUĆA GODINA

SAŽETAK

U radu se pretpostavlja da ukoliko dvije neovisne nasljedne značajke pokazuju sličnu regionalnu razdiobu u pučanstvu suvremene Europe, može se očekivati da su se istodobno širile migracijama naših predaka. Kao mogući primjer opisana je sličnost razdiobe Dupuytrenove kontrakture i Haplogrupe I na Y kromozomu, prije opisanog genetskog markera koji se širio tijekom zadnjeg Ledenog doba.